

ST12 Steam Enhanced Extraction: Has criteria for termination of Steam Injection Been Met?

Status as of 11/6/15 Weekly Progress Report

Criteria for amount of steam to be injected:

Table 5-2 SEE to EBR Transition Criteria Monitoring

Parameter	Target Criteria	Summary of Monitoring or Sampling and Analysis for Evaluation of Progress Toward Transition Criteria
Steam injection (guideline)	319,357,000 lbs	Steam production will be measured at the boilers.

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Total Steam Injected	248.4	million pounds (lbs)
Projected Total Steam Injection	320	million lbs
Steam Injected Vs Projected	78	%

Criteria for amount of steam injection has not been met.

Criteria for residual benzene concentrations

Benzene concentrations	100 to 500 µg/L	Benzene concentrations will be monitored in SEE wells during baseline sampling. Samples of extracted water (see Table 5-1) will be used to evaluate benzene concentrations during SEE operation. Sampling locations during operation will be determined in the field with a sampling strategy that starts at influent to the liquid treatment system and then moves progressively out to individual manifolds and, in some cases individual wells to trace the source of benzene contribution. The locations will also be selected to evaluate the relative contribution of contamination from outside vs. inside the TTZs.
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Progress Report
Steam Enhanced Extraction Remediation at the Former Williams AFB (E8002) Site, Phase 42
November 5, 2015

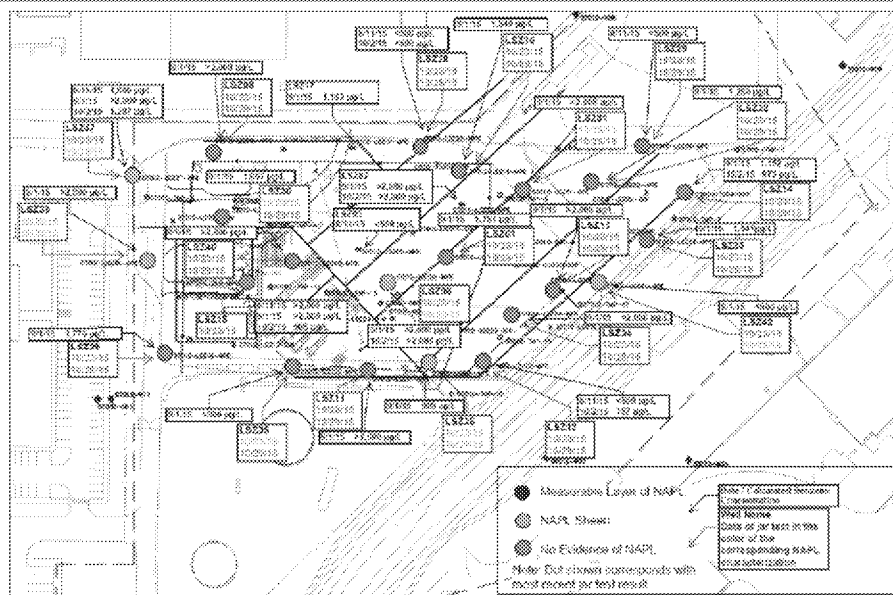


Figure 29. NAPL Screening Results and Calculated Benzene Concentrations - Lower Saturated Zone

Benzene Concentrations in LSZ Exceed 500 µg/L; Criteria has not been met for LSZ

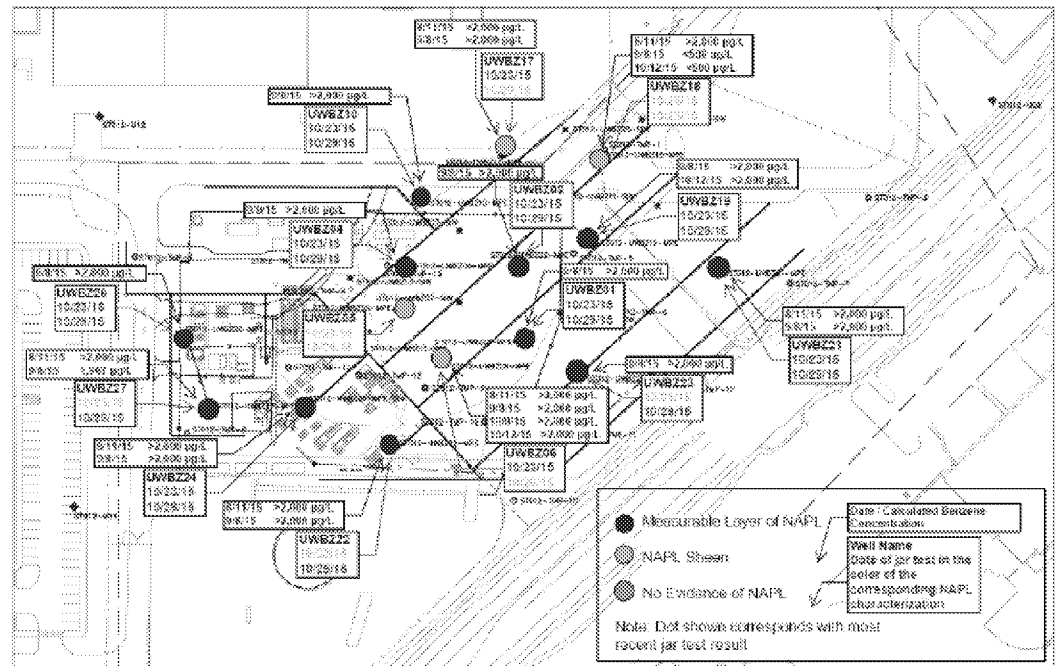


Figure 26. NAPL Screening Results and Calculated Benzene Concentrations – Upper Water Bearing Zone

Benzene Concentrations in UWBZ exceed 500 $\mu\text{g/L}$; significant NAPL present, Criteria has not been met for UWBZ

22. NAPL Screening Results and Calculated Benzene Concentrations

Figures 27-29 below present the screening level results for NAPL detected in samples collected from MPE wells across the site. Screening samples are typically collected on a weekly basis. The figures below also include calculated benzene concentrations of groundwater samples collected from MPE wells across the site.

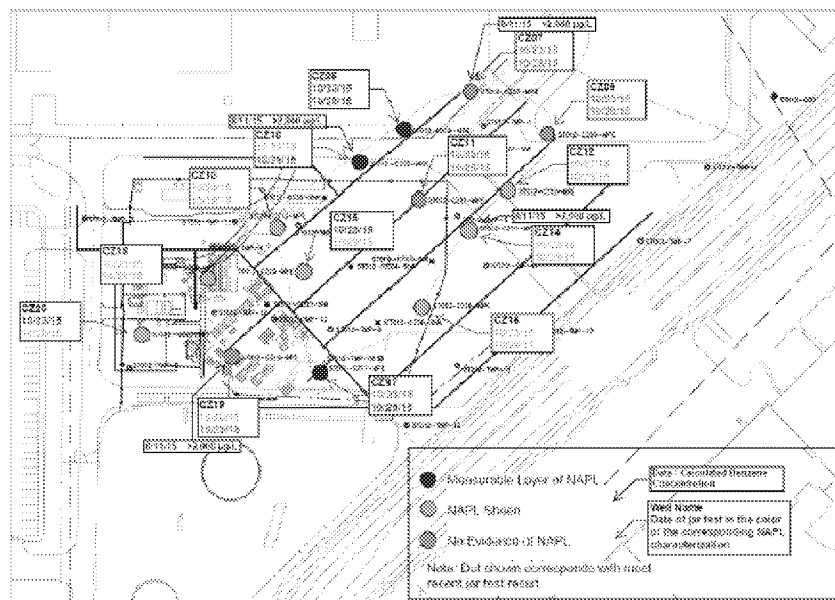


Figure 27. NAPL Screening Results and Calculated Benzene Concentrations – Cobble Zone

Benzene concentrations Exceed 500 $\mu\text{g/L}$ in CZ, NAPL present; Criteria has not been met for CZ

Criteria for Mass Removal

Mass removal	Less than 10 percent of peak removal rate	<p>Mass removal will be determined from a sum of individual mass removal rates such as:</p> <ul style="list-style-type: none"> Recovered LNAPL as measured by totalizing flow meter on the inlet to the LNAPL storage tanks Mass in extracted vapors as measured at vapor collection manifold (vapor flow rate logged in PLC and influent vapor measured by FID/PID) Mass in extracted water as measured in air stripper off gas and liquid laboratory samples (liquid discharge flow rate logged in the PLC, air stripper blower flow rate logged in the PLC, air stripper off gas measured by FID/PID, water treatment influent and GAC influent)
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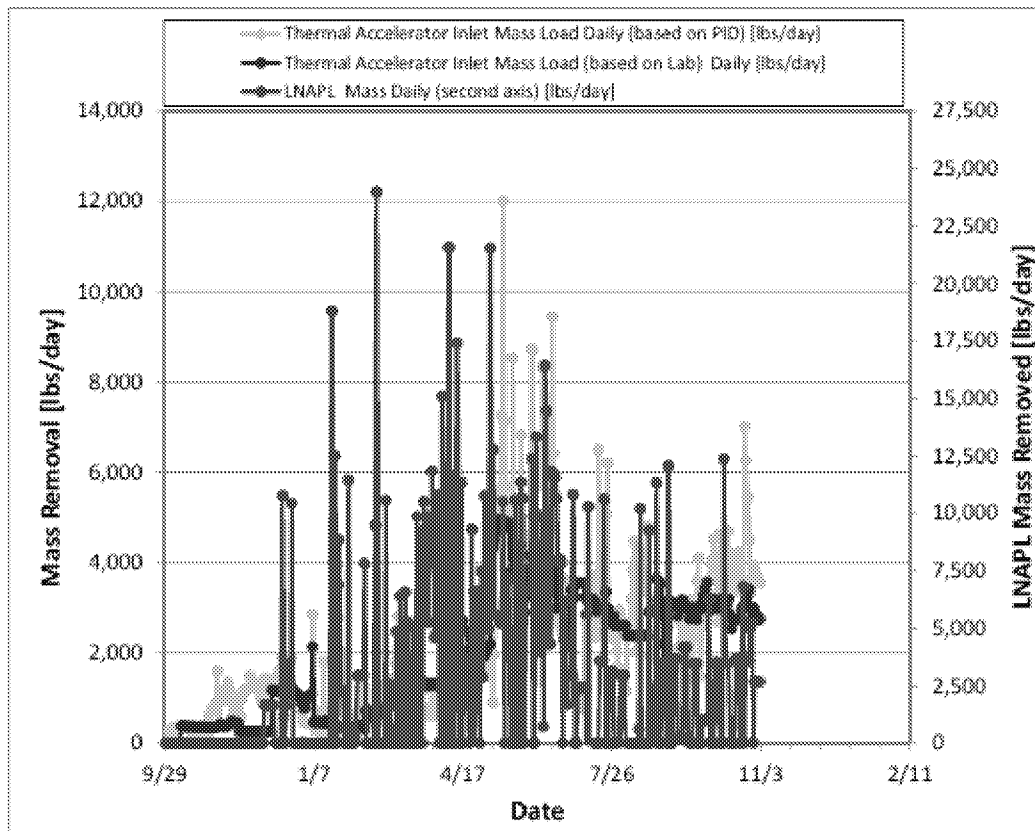


Figure 4. Daily Mass Removed

LNAPL recovery is 30% of peak removal rate; vapor recovery is 50% of peak removal rate; Criteria for termination of steam injection has not been met

Criteria for completion of pressure cycling:

Completion of Pressure Cycling	Completion of multiple pressure cycles in each area	Because the pressure cycling process results in the volatilization of contaminants upon release of the pressure, extracted vapors will be the primary source for measurement of pressure cycling effectiveness. Vapors will be primarily monitored with hand held devices with the objective to demonstrate diminishing returns from pressure cycles.
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This criterion is non specific. The purpose of pressure cycling, and indicated in the statements above is to enhance volatilization of contaminants. It is not intended to improve mobilization and recovery of NAPL which may have been retarded by premature initiation of pressure cycling. Ideally, the bulk of NAPL should be removed first before initiation of pressure cycling as the finishing step. As long as NAPL is being recovered, steam injection should continue, then institute pressure cycling to remove the last of the volatiles. It is unfortunate that we did not discuss criteria for initiation of pressure cycling in the workplan.

Criteria for Boiling Temperatures

Subsurface Temperature	Varies by Depth (higher boiling temperatures with depth – see Figure 5.3, in Appendix D of the RD/RAWP)	17 individual TMPs will be equipped with 15-24 vertical temperature measurement locations per TMP. In addition, each SIW and MPE well will be equipped with the infrastructure for a co-located TMP to be installed for temperature measurements to be collected. Co-located TMPs will be permanently installed for the 18 deep SIWs in the LSZ and will monitor the temperature at the top, middle and bottom of these wells. Two mobile temperature arrays in the CZ and two mobile temperature arrays in the UWAZ will be used to monitor temperatures in the remaining MPEs and SIWs (top, middle and bottom depths). Temperature monitoring of the SIW/MPE wells, along with extracted fluid and vapor temperatures, will supplement the 17 individual TMPs to monitor temperature distribution at the site.
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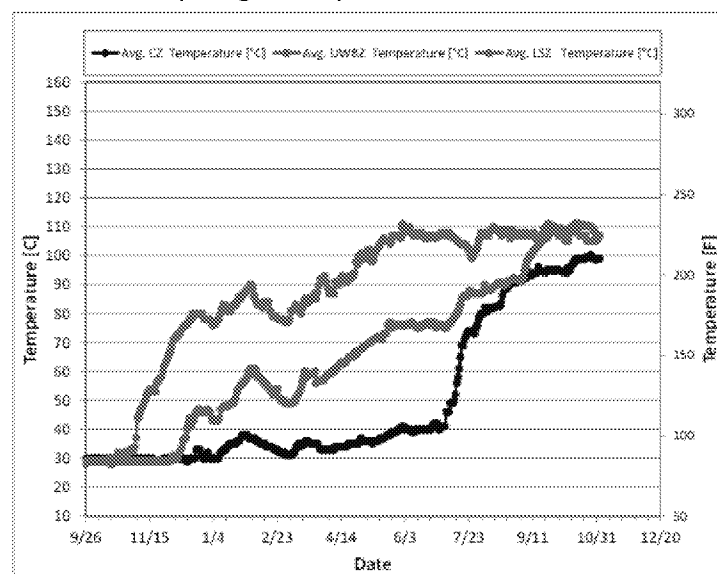


Figure 5. Average Soil Temperatures

Criteria for Boiling Temperatures has just barely been met.

